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ABOUT THE ABDOMEN

V.

TREATMENT BY DRESSING.

BY

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## SEALING OF OPERATIVE WOUNDS ABOUT THE ABDOMEN v. TREATMENT BY DRESSING.

By E. STANMORE BISHOP, F.R.C.S.

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THE effect of the introduction into Surgical practice of a new principle is like that of a stone flung into water. In ever-widening circles, its influence is felt, not apparent all at once, but steadily and constantly modifying and altering views as to the details of practice. This is conspicuously so with reference to the Antiseptic principle—now developed into that much more important thing—the Aseptic principle. Its first appearance altered much, and forced itself especially upon our attention with reference to certain things; but as time goes on, and one sees more and more clearly what it involves, many old things, not at first thought of, and even many of the things which it introduced, and which are therefore comparatively new, are found to need revision, and to have become obsolete, and out of date. It is curious to see the revolution produced in instruments. The substitution of metal for bone or ivory in knife handles for instance, or in trephines. The increasing use of catgut or silk for sutures, and the decreasing use of wire, formerly believed to be so important. The disappearance of seton lancets, of the hernia knife proper—with its guarded end, for division of the neck of the sac through a very small opening in the skin, of the spray, that hall mark of the

early antiseptist, and of many other surgical tools and appliances. But its full effect can not even now be said to be fully appreciated. In two things especially, change is still going on, and opinion is not yet fully settled.

It has always been noticed that after division of any tissues, and especially after the separation of those previously adherent through inflammatory changes, that although all spouting or even evident vessels were closed by ligature, twisting, sponge pressure, or in any other way, fluid still continued to exude from the raw surfaces: such fluid was usually coloured to some extent by blood, and when bacteriology was even faintly understood, was recognised as excellent culture material for the growth of micrococci.\* Any failure to avoid septic processes in the wound, or in the cavity where these raw surfaces existed was attributed to the presence of this fluid, which gradually accumulating, and becoming stagnant in the closed wound or cavity, was supposed to decompose, and it was assumed that the accompanying or sequent septicæmia was due to the absorption of poisonous material thereby resulting. And no one can doubt but that this was true. The practice adopted was however one-sided. Every attempt was made to remove this fluid. Chassaignac introduced his rubber drainage tube, Kœberle one made of glass, and Macewen tubes made of decalcified chickenbone. Counter openings were made in the most dependent parts, so that the influence of gravity might be enlisted in the attempt to drain it away quickly. In the case of the abdomen, all such fluids were believed to gravitate into the pelvis, in women, into Douglas' pouch.

Some striking experiments have been reported, in which it was shown that the most septic fluids might pass through the peritoneum harmlessly so long as they were in constant movement. When once they remained stagnant, danger of a virulent type ensued. Under no circumstances were such fluids to remain, they must be quickly and constantly removed as long as they were secreted. Peaslee, in 1870, described four

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\*In order to avoid tautology, for the purposes of this paper, I have used the words bacteria, micrococci, germs, &c., as synonymous.



kinds of fluid which must be drained away : 1st, blood oozing from adhesions or pedicle, 2nd, fluids from tumour, as ovarian fluid, 3rd, ascitic fluid, and 4th, pus from granulating surfaces, and he advised that an opening be made into the vagina from Douglas' pouch for that purpose. Sims invented a silver drainage tube to be used in this situation. Where this was not done or in men, where it was not possible, a drainage tube of glass was passed through the abdominal wall down to the lowest point reachable in the pelvis, and the fluids which collected in it were drawn off at frequent intervals by a syringe, or it was attempted to syphon them out by threads of gauze or wick. Presently it was found that so long as the tube remained, so long was there always some fluid to remove, and that if left too long, even pus was found in it, though not present originally. So a rule arose, that when the fluid was colourless, and sweet, the tube might be taken away—but this was by no means generally accepted. Some surgeons preferred to leave a rubber tube when the glass one was discarded, gradually, and day by day shortening this, regardless of the fact, that if their previous theories were true, the shortened tube could not reach the remaining pool of stagnant fluid, and so at last, it was abandoned to the same risks as those existing at first. But it was said that if the glass tube remains for 48 hours, by that time a protective barrier will have closed off the main peritoneal cavity, and what is left in contact with this fluid cannot absorb so much as to put the patient in danger. Such a protective barrier has indeed been proved to exist, but it was around the tube itself, and not between the whole wounded area and that of the abdomen proper. Moreover, the whole procedure was based, as will be shown, upon an incomplete idea of the function and powers of the peritoneum.

Moreover, the glass drainage tube had several, and somewhat serious dangers of its own. Unless it were constantly moved or rotated, omentum, appendices epiploica, and even bowel wall were caught in the small openings at the lower end of the tube, not only plugging them, and so preventing any flow towards the tube, but themselves becoming injured. A

tube left unrotated for 48 hours became fixed by the entrance of small tags of omentum into its fenestra which, constricted at their neck by the edges of the opening, swelled up by congestion, at the distal extremity, and thus locked the tube in its position. If instead of omentum, bowel wall was so caught, its peritoneal surface was greatly damaged, and a kind of Richter's hernia was produced. In any case, the task of removal became a serious matter, whilst its delay only intensified the trouble. And this was not all. In one or two cases recorded, as indeed in one of my own, the end of the tube pressing upon a loop of intestine which probably slipped beneath during one of the necessary liftings, cut a hole into the gut, and a fœcal fistula or worse resulted.

Nor, should all these troubles be avoided, had the patient or surgeon heard the last of the drainage tube. There was yet another, and apparently an unavoidable result, and that was subsequent ventral hernia. The muscles of the abdominal wall are so disposed, that when firmly united, their combined action compresses the abdominal contents towards the spine, but when once the central union is divided, each half tends to drag itself still further from its fellow of the opposite side.

The aponeurosis which connects them is, of course, their tendon, and the practice of referring to it as the rectus sheath is somewhat misleading, as this name tends to emphasise what is, in reality, only a detail in its construction, and to divert attention from its essential function.

If reunited at once, and kept together by sutures which will not yield until the plastic stage is over, and a firm fibrous union established, hernia does not appear to be probable, but if allowed to remain open at any one spot, until granulation tissue is formed, the union is for a long time so soft and pliable that the action of the muscles slowly but surely thins it out, until a very little increase in the internal pressure of the abdominal cavity demonstrates the weak spot by a hernial protusion. The following cases illustrate this effect of the drainage tube:—

(1) Mrs. H. Æt 30. Admitted into Ancoats Hospital, with a

right ovarian cyst: operation, July 7, 1893. Parovarian cyst removed. Divided surfaces of right broad ligament united by suture. Glass drainage tube, much retching, tube removed on third day. Omentum entangled, tied off. Whilst drawing upon omentum in removing, some tendency to syncope. Five days after, severe rigor and return of vomiting, temperature reaching  $105^{\circ}$ . This state of things lasted four to five days, passed off after free purgation, Patient discharged well, August 30.

1897. September. Returned with large ventral hernia at site of drainage tube.

(2) M. B.  $\text{\AA}$ et 35. Ventral hernia of large size. Admitted October 19, 1895. Five years ago, ovaries removed by abdominal section at another Hospital—followed by drainage.

(3) S.E.  $\text{\AA}$ et 29. Large ventral hernia in median line. Admitted October 6, 1894. Reaches from umbilicus to  $1\frac{1}{2}$  in. above pubes. Widest transverse point 6 in., following abdominal section in July, 1893 with drainage.

Russell estimated the cases of post-operative hernia at 8 per cent. in all drained cases in the Johns Hopkins' Hospital.

The use of a glass drainage tube can therefore by no means be looked upon as harmless.

In April, 1897, a most important paper appeared in the American Journal of Obstetrics, the result of observations upon 1,700 cases of Abdominal Section in the Johns Hopkins' University, by Dr. Clark. He quotes Schroeder, Zweifel, Olshansen, and Czempkin as all agreeing in reprobation of drainage in abdominal cases. After describing Muscatello's observations on the structure of the diaphragmatic peritoneum, he gives also his views as to the normal currents in the peritoneal cavity, which carry solid particles through this membrane into the mediastinal glands, and thence into the blood current, and which are accelerated by the action of gravity. He quotes Wegner, who showed that the peritoneal surface was equivalent in area to that of the skin surface and was capable of absorbing in one hour three-eighths per cent of the whole bodily weight.



In no part of the body, he says, are pyogenic organisms more effectually destroyed than in the abdominal cavity, provided it is unhampered by artificial conditions. Such artificial conditions are at once produced by the presence of a foreign body, such as a glass tube or a gauze drain. Moreover, the result of the prolonged contact of a foreign body is to cause a destruction and exfoliation of the endothelium, followed by the escape of leucocytes and serum, which quickly surround it with a fibrinous envelope, so that even if at first effused fluids can be more easily removed by the drain, in two hours it acts as a plug, preventing the outflow of fluid which then accumulates in the dependant pockets. *In many instances, he says he has found encapsulated collections of infected matter at the autopsy within half a centimetre of the drainage track.* The amount of fluid removable by a drain is he says, compared by that removable by the unhampered peritoneum, as a tiny brook to a great river in draining a lake.

Taking 100 cases, each of similar pelvic inflammatory conditions, untoward results, including fatal and complicated cases followed in twenty per cent. of undrained, but in fifty-four per cent. of drained operations: suppuration of the abdominal wound existed in fourteen per cent. of undrained, in twenty-four per cent. of drained cases. Deaths were six per cent. in undrained, thirteen per cent. in drained. These are taken from Dr. Staveley's resume of 563 abdominal cases.

Very instructive is the examination by Drs. Miller and Clark of sixteen gauze drains used after abdominal sections. From each a portion was removed from the upper, the middle, and the lower portions, and tested for bacteria. In every instance control cultures were made of the fluids present at the time of operation, and in them no bacteria were found, whilst the upper portions of the drains yielded cocci in every instance, the lowest portions in nine, the middle in five out of the sixteen.

It used to be considered that the escape of pus from, say, a pyosalpinx into the abdominal cavity during removal necessitated the use of a drainage tube, since bacteria were certain to be present, and could not certainly be removed by sponging, or



flushing. Robb, Peaslee and others all agreed in this. The results of bacteriological examination of such pus is curiously opposed to such a view: thus out of 42 cases examined for this purpose by Miller, no bacteria at all were found in 34 cases; in 144 cases examined by Schauta, streptococci and staphylococci were found only 4 times; Menge found the staphylococcus once in 26 cases, and Morae once in 33.

It appears therefore, that we may consider pus found in chronic pus sacs as practically free from active organisms, and as merely representing the debris left behind after the authors of it have perished. With regard to other fluids, Waterhouse's observations show the necessity for careful hæmostasis, before the closure of the peritoneum, so as to avoid the possibility of including blood-clots of any size; the only other fluid likely to be present in the majority of cases then will be the serous oozing from any large adhesion which has necessarily been separated during the operation. As far as possible such raw surfaces should be covered by adjacent peritoneum, which is attached so loosely that in most instances it can be drawn over them, and this fluid may safely then be left to be dealt with by that membrane. It is, of course, evident that progress in this direction is absolutely dependant on the exclusion of germs, the maintenance of absolute asepsis.

There remain a very few exceptional cases, in which great damage has been done to intestine, and in which it is impossible to feel certain that the bowel wall may not give way. As to these, opinions are still greatly divided, and it seems at present impossible to lay down any definite rule—but these cases are rare.

The whole practice was, as we have said, one-sided. If assumed that the fluids exuded were themselves dangerous and must be got rid of: and this assumption is now being questioned, and the results are notable. The belief which is daily gaining ground, and which promises to drive the drainage tube out of, possibly, the whole surgical field and certainly out of abdominal work, is that these fluids are not only harmless but extremely useful, if uncontaminated, and that our efforts must be directed

not towards their removal, but towards their absolute and persistent freedom from germs.

But the question of drainage of the abdominal cavity incidentally involves the question of general drainage of wounds. And were not this paper likely to be rendered thereby interminable, it would be easy to show that many of the arguments used in reference to the one apply with similar force to the other. In this relation, however, the treatment of the incision in the abdominal wall is of importance; if no drainage is required for the cavity, no drainage is also needed for the abdominal wound. We have, by its elimination, all the conditions favourable for primary union of the tissues composing that wall: and when once the whole line of incision is closed, and the edges of the skin approximated in a right line, it is evident that the second question arises to which we have referred as in process of change, and that is the one of Dressings.

When fluids exuded from raw surfaces were looked upon as harmful in themselves, it naturally followed that in situations where they were readily reached, every effort should be made by ample absorbent dressings to soak up and carry away all that could be so treated. Gauze, wood-wool, absorbent cotton, &c., were piled over the line of the incision even if closed. Still more if a drainage tube connected the deeper parts with the surface. There developed naturally a desire for dryness. Bacteria might be—probably were present, but they could not develop if no culture material was allowed to remain. The theory was to a great extent correct, and in proportion to its correctness good results were obtained. But the advocates of the theory forgot, or ignored, the fact that the *culture* material was also *repair* material, and that therefore the ideal result, although obtained, was necessarily somewhat postponed in proportion to the success with which that material was abstracted from the line of repair. The same idea was in the minds of all. *Divide the bacteria from their culture material.* Union between these two must inevitably result in inflammation of the parts around, or in septic processes. But it is evident that the same

result will be obtained if bacteria are excluded, and the repair material retained, with an additional advantage to the rate of repair. It was often observed that infection most usually did not occur at the time of operation—it was generally at that of the first dressing, and surgeons began to vie with one another as to the length of time the first dressing could be postponed. To any great postponement, the presence of the drainage tube was an insurmountable obstacle, and especially was this the case when a glass intra-peritoneal tube was in question. In other cases, Macewen attempted to meet the difficulty by the use of decalcified bone tubes, which, like catgut, might be absorbed when the period of their usefulness had expired. Possibly I have been unfortunate, but I have always found these useless, because at a certain period of their absorption they collapsed and formed a mushy plug which itself decomposed in the tissues of the wound, or at least, hindered its closure. In any case, the amount of dressings piled over the wound was in proportion to the length of time the surgeon hoped to keep his wound safe from the dreaded first dressing. Some placed a layer of jaconet or other more or less impermeable material near the outer layer of the dressing, in order that any fluids might not pass straight through at once, but be diffused through the whole mass. My own experience, as that of many surgeons in reference to this, was that the fluids so confined, and soaking the deeper layers of the dressing, acted upon the epithelium of the skin around the wound, and produced a sodden condition which sometimes ended in eczema, sometimes furunculosis—always in a tender sensitive surface.

But the drainage tube once eliminated, the problem is immensely simplified. We wish simply to keep apart the bacterium from its culture material. Most surgeons can feel secure as to the aseptic conditions of their operated wounds at the time of operation. Why the first dressing should be so fatal, admits of two or three explanations. Probably the importance of the moment of operation impresses all concerned more forcibly with the necessity for cure. Often the surgeon



has to leave the dressing to a subordinate who is not so absolutely imbued with a sense of its essentiality. In any case, we are more or less at the mercy of those who prepare and preserve our dressings. If we could, at the moment when the operation is finished, apply some air-tight material which would seal the wound from the entrance of anything from without, and which would remain in air-tight contact, until healing was complete, all nutrient fluids would be preserved for their legitimate purpose, bacteria would be absolutely excluded, and primary union might be reckoned upon, whilst we should be free from that dread of "the first dressing."

Such is the reasoning upon which some progressive surgeons have lately been acting, and the result appears to be justifying their arguments. The first attempt was made with collodion and a wisp of cotton wool, which was so arranged as to cover the wound and its surrounding skin for some distance. Good results were obtained by this, primary union usually followed, but perhaps a later material has on the whole shown itself more fitted for the work. The collodionised wool shut off the line of incision from immediate observation. If things went wrong, the deviation was not immediately recognisable. With the new dressing, celloidin, first described I believe in use by Dr. Mackenzie, of Burnley, in the *B.M.J.*, Feb. 1, 1891., and recommended by Dr. R. T. Williamson, of this city, a transparent closely adherent film could be applied which in addition to this advantage of transparency added another—that of strong contraction. This latter quality acted for good in two ways. It decreased the area of the scar, an immense addition for good in some instances, as for example in scars about the face, and it tended to contract the skin vessels immediately around the line of union, so limiting that tendency to overfulness of these vessels after any traumatism. But its main advantage, after the cardinal one of aseptic closure, was its transparency.

Dr. Mackenzie reported three cases treated in this way with success: an amputation of the breast, removal of a large lipoma from the gluteal region, and a strangulated hernia.



The material used is a solution of celloidin in alcohol and ether, with the following formula :—

Celloidin .....	one part
Abs. Alcohol .....	} <i>a. a.</i> parts IV.
Eth. Sulph. ....	

It is a clear fluid, which requires to be kept in a cool place, and in a well-stoppered bottle. It is applied with a brush to the absolutely dry surface it is intended to cover. In order to obtain such dryness, it is well to wash the part quickly with ether. It sets in about 30 seconds and forms a firm air-tight connection with the underlying skin, becoming at once slightly puckered at the edges; if all goes well, it even causes the part to which it is applied to sink perceptibly below the level of its surroundings. The stitches, with their points of entrance and exit, and the line of union, can all be plainly seen through the glass-like film which is formed over them. About the 9th or 10th day the edges become loose, the central part still remaining firm. By the 12th day it will probably have cracked across in places; dependent upon the amount and kind of movement possible in the parts so covered. When this takes place it will be found that the remainder easily peels off, being only held by the sutures, which should be cut close to the knot: the position of these is easily seen through the clear film. Rarely it may be well to reapply. As a rule, union is found to be primary and perfect if the necessary care has been to insure success.

The following cases are given as illustrative of its use, chiefly about the abdomen. Two cases are added of amputation of the breast and axillary glands, to show the advantage of the thin fine scar obtainable; not merely on the surfaces, but uniting the deeper tissues, and which permits of far greater movement than does the bulky, lumpy scar which results from healing by granulation.

In dealing with children especially, there is a great advantage in being able to dispense with dressings; and most of all is this so when the wound is near the natural emunctories. Children bear confinement badly and if we are not to see our wounds covered by a urine poultice, than which I can conceive of no worse dressing, we must confine them pretty strictly

during the first few days at all events. A restless irritable child, too young to reason with, as in a case of mine of hernia of ovary (at three months of age, through the inguinal canal) will readily fret itself into a condition which is not favourable to healthy primary union. That by this means we can allow it to throw itself about as it pleases as soon as the anæsthesia is over, with perfect security as to the condition of the wound, and the non-entrance of urine even if it should escape directly over its track is a great relief to the surgeon, and saves the nurse perpetual and even then unavailing work.

In many cases, there has been noted a primary rise of temperature, this, however, never goes beyond 100° and rapidly sinks again. If it should again rise, I believe it means failure in the original intention.

But absolute sterility in the precedent operation is of paramount importance. This becomes doubly necessary if we propose to seal the wound.

The manner in which the wound is closed is also an essential. It must be absolutely dry to begin with. There must be no oozing from any source whatever. The possibility of secondary or consecutive hæmorrhage must be rigidly excluded. Time spent over this is not wasted, as case 9 amply proves. At the same time, there must be no bruising of the wound surfaces. In making the wound, *sharp* knives or scissors must be used, and particular care should be taken in dividing fat, which being poorly supplied with blood is very apt to necrose. Suturing of the wall of the abdomen should be done in tiers, for other reasons as well, such as the avoidance of hernia, but for our present purpose, mainly because in this way only, it is possible absolutely to avoid the leaving of dead spaces. By uniting with care the peritoneum, the general cavity of the abdomen is shut off from the wound and a firm counter pressure is obtained from below to the atmospheric pressure outside, whose aid it is desired to enlist. When the aponeurotic layer is nearly closed, firm pressure is applied over this to force out any air or moisture which may remain, and this pressure is maintained until the last suture is tightened. The surfaces of

the divided subperitoneal fat are thus pressed together and kept in place without the need of sutures in itself. All air being pressed out, there can be now no dead spaces between the aponeurotic layer and the peritoneum. The inter-abdominal pressure from within and the atmospheric pressure from without keep these layers in accurate approximation. In the same way sutures in the subcutaneous fat are unnecessary, for when the skin is united, all air and moisture having been pressed out, no space can exist between them. The wound is air-tight, and must be kept so, until the celloidin is applied, when this material will maintain that condition during the process of union. That the wound can be and is in this way made air-tight, is well demonstrated in the cases of removal of axillary glands, when the skin immediately applies itself accurately to the tissues left behind, sinking into and regularly outlining the gap produced: and so remaining until the celloidin peels off when organic union has taken place, not merely between the edges of the wound but between the deep surface of the skin and the parts it covers. This is a great improvement upon the old method of draining this space, which not only greatly prolonged the convalescence, but tended to the production of a thick scar, which bound down the arm, and by its contraction, compressed the veins and nerves of the extremity, often producing œdema and neuralgia in it.

*Case 1.—Ovarian Cyst*, Miss G., Æt 23, unmarried. Menstruation commenced at 15 years, normal, but increasing latterly in quantity. Enlargement has been noted for two years.

April 28. *Operation.—Tumour multilocular.*—Embedded in right broad ligament, surrounding uterus, and opening up left broad ligament. Weight of Tumour when empty, 3lbs. 10z., fluid contained, 5qts. 1pt. Removed with uterus which was amputated at the internal os. After a wedge-shaped piece had been removed, the uterus and broad ligaments were carefully united with silk right across the pelvis, the opened up right broad ligament being closed by a continuous buried silk suture in layers, so as to leave an unbroken surface of peri-

toneum. All hæmorrhage was carefully stopped, the pelvis dried with sponges, and the abdominal wound closed by three layers of suturing without drainage. Celloidin dressings: passed urine naturally the same night, flatus the next morning. Sat up on May 11th, and left the Home well on May 21st with a firm, strong cicatrix. The celloidin became loose and was removed with the skin sutures on the 10th day.

*Case 2.—Removal of Appendix.*—Mr. W. Æt 20. Two attacks of catarrhal appendicitis. As soon as recovery from the second attack was complete, the appendix was removed.

June 2. Incision just inside Langenbuch's line. Sheath of Rectus opened, fibres of muscle drawn inwards, and posterior layer of sheath incised. Peritoneum opened and appendix found, greatly shortened and adherent in the anterior entero-colic angle. Many adhesions of omentum, &c. Appendix tied, removed. Stump buried in cæcum by silk Lembert sutures. Peritoneum closed by cat-gut sutures, posterior layer of rectus sheath by interrupted, buried silkworm-gut points, muscular fibres of rectus allowed to fall back into place, and anterior layer of sheath united in the same way. Skin and subcutaneous tissues united by horsehair, and covered by celloidin. Coating became loose on 12th day, and was removed with skin sutures. Patient up on 13th day, discharged well, with firm cicatrix on 24th day.

*Case 3.—Vesical Calculus.*—Supra-pubic cystotomy, A. M. Male. Æt 15 years. Sent by Dr. J. Smith, Pin Mill. A thin strumous lad, who has had post-nasal adenoids removed a year before. Extremely nervous and emotional.

For the last 12 months has complained of pain on urination, and for about one hour after—this is becoming worse. Can now only retain urine for two hours. Small specks of blood in urine occasionally. Pain always worse at night. Urine alkaline sp. gr. 1015., no albumin. Sound detects large rough calculus.

June 29, 1897.—Supra-pubic lithotomy. Phosphatic stone, weight 305·5grs. Pus found coating one side. Bladder washed out and closed by one row of silk matrass sutures, with a super-



imposed line of Lembert sutures. The retro-pubic connective tissue is carefully freed from clot and dried. Abdominal wall closed by silkworm-gut to rectus fascia, horsehair to skin. No drainage. External wound coated by cotton-wool soaked in collodion. No dressings. Salol had been given before operation and was resumed on the next day.

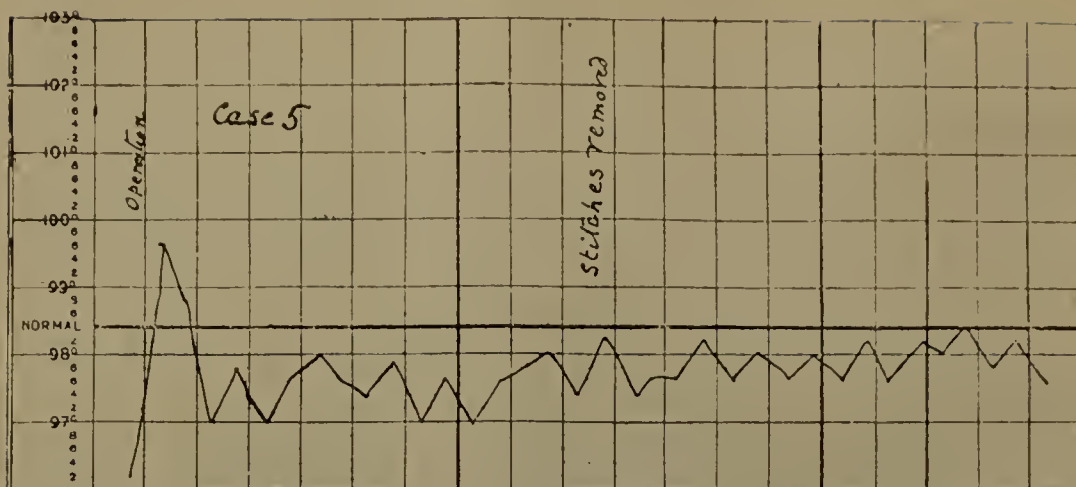
Temp. reached  $100^{\circ}$  on the night of the 29th, but fell to normal on July 1st, and never afterwards rose above  $99.4$ . Urine passed normally.

Dressing became loose on the 14th day, when the external sutures were removed. The wound had united by primary union. Patient got up on 21st day, was discharged well on the 32nd.

*Case 4.—Supra-pubic lithotomy.*—F. H.,  $\text{\AA}t$  2 yrs. 10 mos. Father died of phthisis. Mother living, but very anæmic. Child was not suckled. Child is thin, fairhaired, with prominent forehead, strumous. Weight under 7lbs. Crying before urination for 9 mos. Sound and recto-bimanual examination detect calculus in bladder.

June 22, 1897.—Supra-pubic cystotomy. Stone smooth, oval, urate of ammonia, weight 110grs. Bladder otherwise healthy. Wound in bladder united by catgut mattress sutures, the musculo-fibrous abdominal wall by buried silkworm-gut, the lowest suture picking up the loose retro-pubic cellular tissue. The skin by horsehair. No drainage. Sealed by collodion and cotton wool. No other dressings or bandages. Dressing became loose and was removed with sutures on the 14th day. Reapplied for safety although the wound was quite healed, for eleven days longer, when it again became loose and was not repeated. Discharged well at the end of a month from the date of operation. Catheter was left in at time of operation but forced out the same night, and urine passed naturally afterwards.

*Case 5.—Left inguinal strangulated hernia.*—Wm. Judge,  $\text{\AA}t$   $1\frac{5}{12}$ . Hernia first noticed December 5th, 1898. Vomiting started next day when he was brought to the Hospital. Vomit was never fæcal. Hot bath, no result. Operation the same



night. Sac opened, loop of small intestine found, pretty tightly constricted, but of healthy colour. Neck of sac divided. Bowel returned. Conjoined tendon and Poupart's ligament united by silk sutures. No drainage. Celloidin. December 15th Celloidin being loose, this and external sutures removed. Slight irritation at points of exit of sutures. Dusted with Ac Bor.; Dec. 26th. discharged perfectly well.

*Case 6.—Fibro-cystic Uterus, Pan-hysterectomy.*—Sent by Dr. Rogers of Stockport. Mrs. R. *Æt* 39. No full time pregnancies, but several miscarriages. Excessive menstruation for 14 years. For the last three years, undoubted signs of fibroid uterus. Has passed ten months out of the last twelve in bed. Periods now come on every fortnight. Last ten days, and she uses nineteen napkins per day, made of bath towels.

Abdomen enlarged to level of umbilicus. Mass central, symmetrical, of unequal consistence. Main tumour lies in front, and to the left. On the right, a tender, elastic mass.

September 21, 1898.—Operation begun per vaginam, after tying the uterine arteries, opening Douglas' pouch, and separating off the bladder, the patient turned into the Trendelenburg position, and the tumour removed by *cæliotomy*. The pelvic peritoneum is united over a gauze drain passed into the vagina, and the abdominal wall closed by triple suture, and celloidin dressing. No supra-pubic drainage. Sutures with loose celloidin removed on 11th day. Primary union. Vaginal

gauze removed 3rd day, followed by daily douching. Quick



Case 6.

2½ MONTHS AFTER OPERATION.

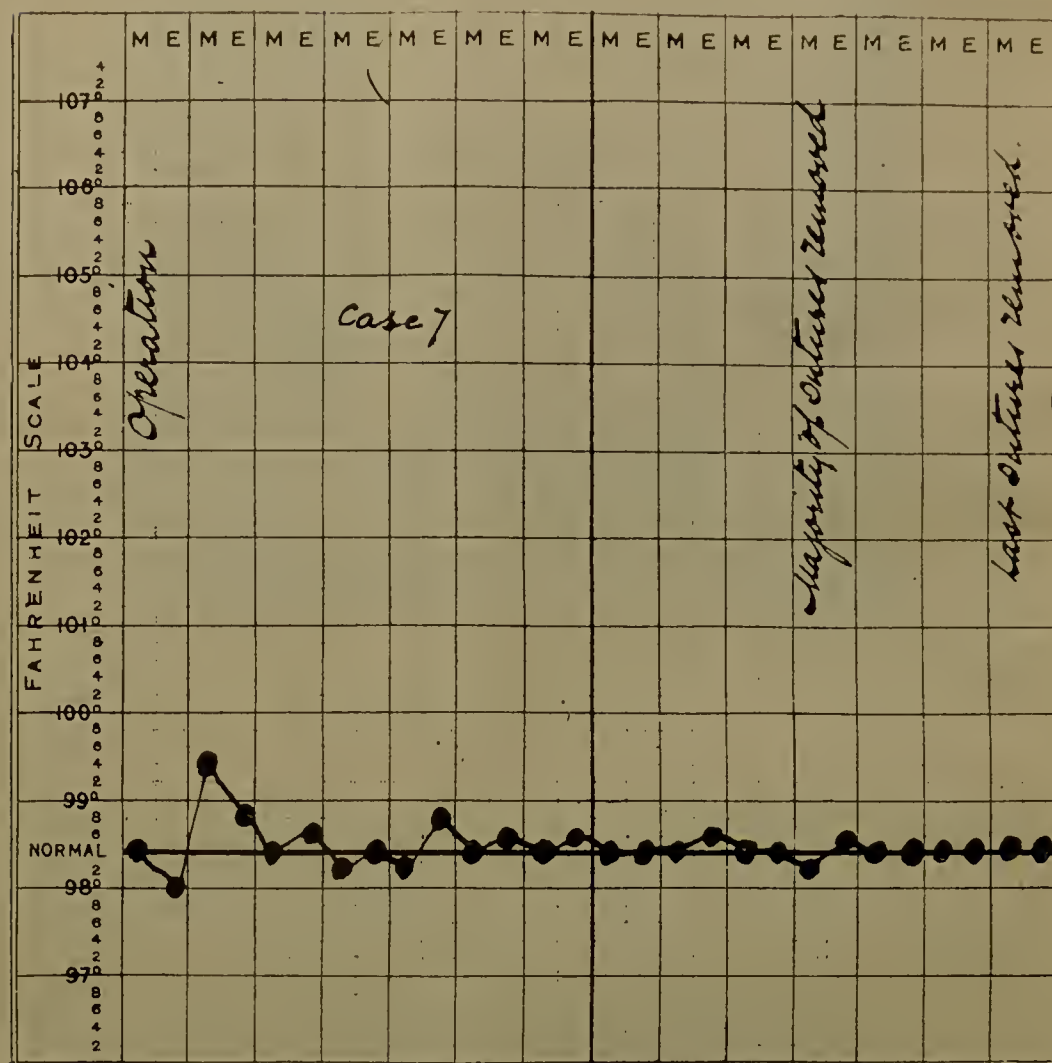
and uneventful recovery. Photo at end of two and a half months. It will be noticed that although the patient has become much stouter, the scar is a mere line, and has not become broader.

*Case 7.—Schirrus of breast and axillary glands.*—Mrs. J., seen with Dr. Gunn, of Fairfield.

Patient is a healthy-looking woman of medium height. Left breast is hard, nodulated in outer quadrant, with retracted nipple. In axilla are several large hard glands, passing up beneath pectoralis major. Has noticed enlargement for 2 years : pain for 8 months. There had been slight loss of power in grasping, some pain about back and inside of arm, and occasional swelling on the back of hand.

Operation, Sept. 19, 1898. Breast removed with glands by racquet-shaped incision, axilla cleared out. All vessels tied with silk. When all absolutely dry, skin was united by horse-hair sutures, with one or two intermediate of silkworm-gut, so that the edges were in perfect apposition. All air and fluid

carefully pressed out before the last sutures were tightened. The skin fell over the large gap in the axilla, being pressed into



perfect apposition by atmospheric pressure. Covered by celloidin when dry. The axilla was packed by cotton wool which also covered the chest, and was kept in apposition by a many-tailed bandage.

Sept. 29th.—First dressing. Sutures and loose celloidin removed. Primary union. One or two fragments of celloidin in the highest part of axilla not being quite loose were left to be removed four days later.

Photo taken Nov. 21, 1898, shows the thin supple scar, permitting of high elevation of the arm and free movement.





2 MONTHS AFTER OPERATION.

Dec. 30, 1898.—Arm can be lifted quite as high as the right: 18 inches above vertex; the scar does not bind down the arm in any way, it however becomes thin and ridge-like on lateral extension. The movements backwards are slightly impeded.

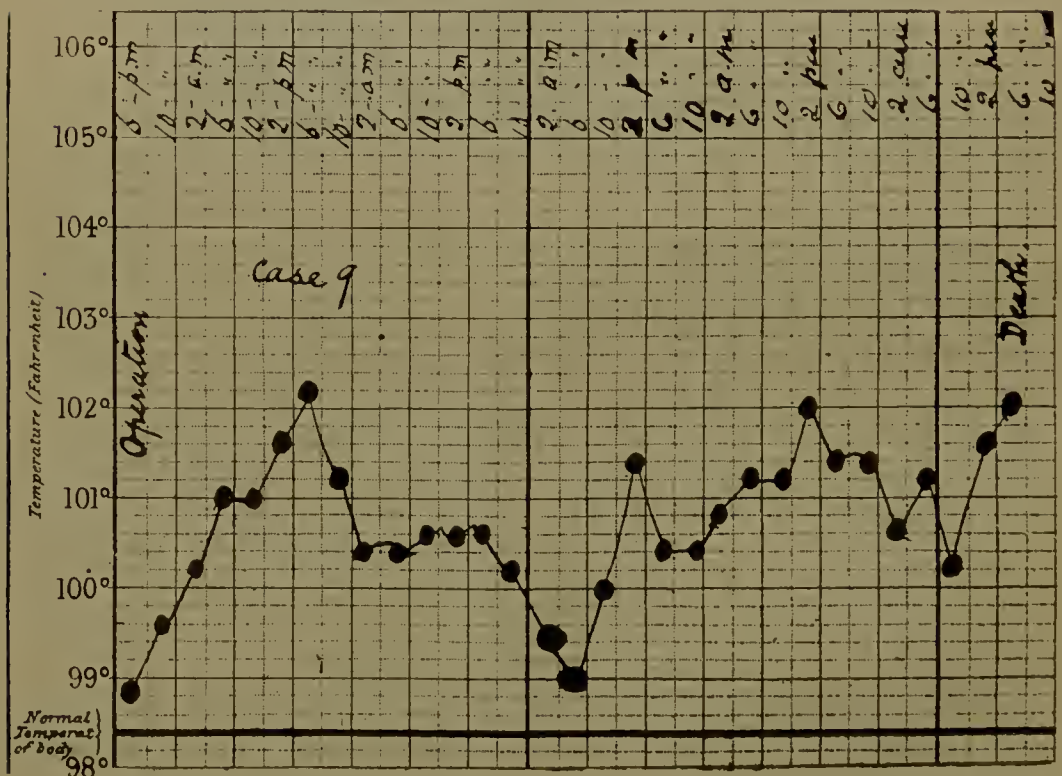
*Case 8.—Carcinoma of left mamma, with enlarged axillary glands.* Mrs. B., *Æt* 63 years, seen with Dr. Duggan, of Bowdon. First noticed  $2\frac{1}{2}$  years previously. Operation which cleared out the axilla Nov. 28, 1897. Celloidin became loose, and was removed with the sutures Dec. 10th. Primary union.

Dec. 24, 1898.—There is no sign of return. Arm rises to right angle.

When care is not sufficiently taken to ensure dryness, and complete hæmostasis, the results are correspondingly disastrous, as the following cases will show.

*Case 9.*—*Large Internal Fibroid.*—Mrs. L. Aet 47. Uterus enlarged in all directions. Has suffered for some years from metrorrhagia, but complains chiefly of dysuria. Has required the use of a catheter several times.

Operation of panhysterectomy (abdominal), August 12th 1898. After removal of the uterus with tumour, gauze was drawn through into the vagina from above downwards. The pelvic peritoneum was then united over it by silk suture en surjet, so as to turn all raw surfaces into the vagina. The pelvis was dried out by sponges, and the abdominal wall closed by triple suture. The woman was becoming collapsed, and probably sufficient care was not taken to stop all oozing in the subcutaneous layer of fat, which was very thick. Sealed by celloidin. As will be seen, the temperature immediately began to rise, and she died on the 17th, with no symptoms of peritonitis, but those of septicæmia.



The autopsy on August 18th showed a large collection of broken-down pus, blood and fat in the subcutaneous tissue. The surfaces around were greyish and sloughy. The peri-

toneum was closed, and when opened, showed a perfectly dry, healthy cavity. The intestines were normal. The line of suture in the pelvis was covered in.

The following case may serve as a contrast to Nos. 4 and 5, showing the absolute necessity of freedom from any septic material.

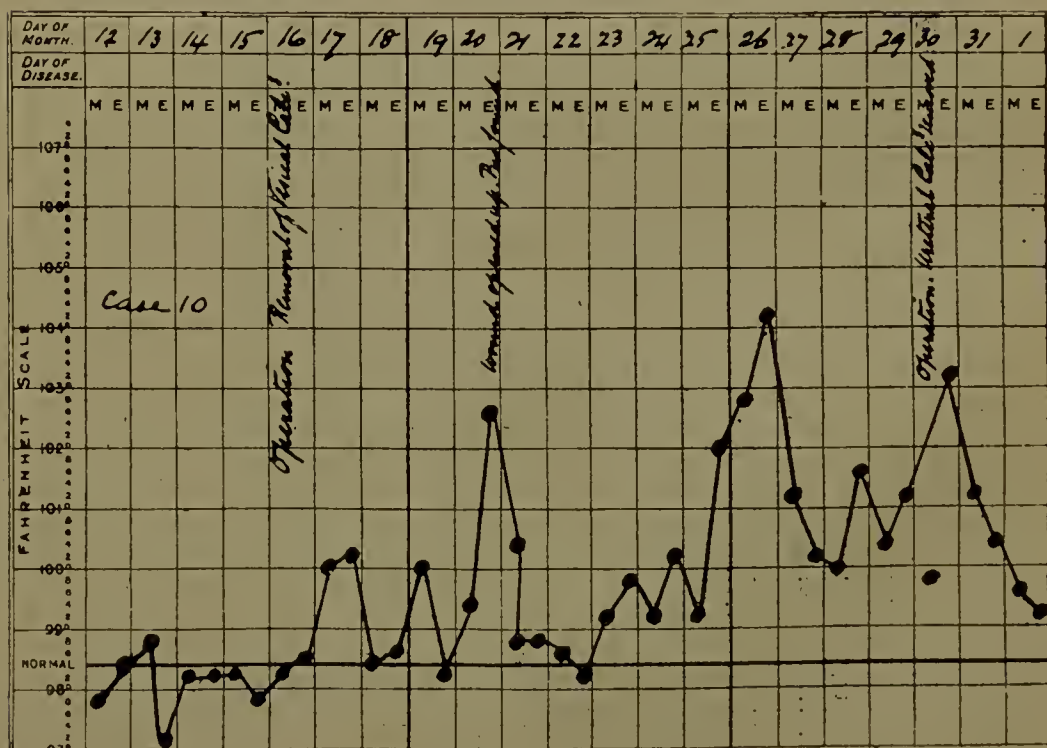
*Case 10.*—M.K. Æt 6. Very thin and poor looking boy. Has complained of pain at end of penis, and occasional passage of blood "since babyhood." Has been sounded for stone three times. December 13th, 1898.—Exam. by sound shows large stone in fundus of bladder, to the left.

December 16th, 1898.—Trendelenburg position. Suprapubic incision. Bladder inflated after separation of muscles, and divided on sound. Stone found in dilated portion of bladder, above and to the left. Some difficulty in removal owing to size of stone, which weighed 2oz. The outer layers were friable, and some chips of it were found afterwards in the bladder and loose sub-pubic cellular tissue. All visible particles removed, and bladder washed out. Bladder opening then united by mattress silk sutures, muscular wall by silkworm gut, and skin by horsehair. Sealed by celloidin. Temperature rose same night to 100°, but fell the next day, to rise again on the 19th, and on the 20th it reached 102°. The outer surface looked quite healthy until the 19th, when it was noted that the usual puckering was absent, and a faint, reddish, shiny appearance surrounded the celloidin. A catheter had been kept in, through which urine escaped freely. This was faintly alkaline on the 18th and 19th, but became acid again on the 20th, under small doses of salol.

On the 20th, as soon as the temperature was found to be rapidly going up, the celloidin was removed and the stitches cut. As soon as the skin edges separated, some serous fluid escaped, followed on separation of the muscular layer by about six ounces of pus, with however, no urinous odour; the bladder appeared to be united. A drainage tube was left in the cavity, which was washed out with biniodide solution, and the temperature promptly fell to normal the same night.



The temperature, however, rose again on the 28th, and the finger was passed into the rectum to discover if any post-pubic abscess had formed. Nothing was found in that region, but on passing higher a hard nodule was felt at the right ureteral orifice. This was fixed and elongated from above downwards. An impacted ureteral stone was diagnosed. The child became worse, was emaciating rapidly, and complained of pain and tenderness in the right renal region. On the 30th Dec., under chloroform, a sound was passed into the bladder, and the bladder wall which was well united except at a small point just above the pubes, was again divided upon it. The finger passed in detected the point of a fixed stone. Dr. Jackson passed his finger into the rectum and formed a counter point of pressure behind it. The stone was in this way shelled out into the bladder by pressure between our two fingers, and removed. A free gush of pus, evidently from the kidney, followed. The bladder was washed out and its edges united to the skin by silkworm-gut, the previous raw surface having been touched by a solution of Zn. Chlor. The child ceased to breathe just after the dislodgement of the stone, but two or three applications of





the battery to the phrenics started respiration again, and the child revived. Its colour was good throughout. The fistula is still open (Feb. 4, 1899) but the urine is now free from pus.

In both these cases the temperature chart appeared to be the safest guide. The local symptoms were at first sight misleading, but the absence of puckering with the shiny appearance of the skin appear to be sufficient to suggest the presence of banked-up fluid. In all satisfactory cases there is marked puckering at first, as shown in figure 3. There is no suggestion of pointing, no feeling of fluctuation, no œdema to suggest what is going on below, but as will be seen by a comparison of the accompanying charts, there is a marked difference in the temperature, and it will probably be found that if the temperature rises a second time beyond 100°, immediate re-opening is required.

Such results, however, of course only emphasize the necessity for attention to detail, and are of no force at all, as an argument against the method itself. Slapdash surgery has nothing in its favour, but is an ignoble "playing to the gallery," by those who wish to be considered "brilliant" surgeons by those but poorly qualified to judge. Its time is over. Sound surgery considers nothing of any importance that does not tend towards the well-being of the patient, and everything worth attention which subserves that end. If any method can be shown directly to tend towards that result, it surely matters nothing that it requires extra care, time, pains, or trouble. If it fails for want of either, it is the fault of the surgeon, when once the necessity for these has been demonstrated.

The following case, seen with Dr. Morris, of Urmston, is of interest in this relation as showing the relative disadvantages of the ordinary system of dressings in children.

From Nov. 8th to 12th, 1898, the patient, a female child of six years of age, suffered from vomiting and epigastric pain; improvement then took place, and the child was allowed to be up on the 18th and 19th. On the 20th it became much worse, with frequent vomiting; abdomen became distended, with great prostration. There was well marked pain constantly referred

to a point on the left of the umbilicus. Absolute obstruction was present, and continued until the operation, although waves of peristalsis, coincident with increased pain could be observed.

On Nov. 23rd, when I saw her with Dr. Morris, all these symptoms were present, and an exploratory laparotomy was advised. This was carried out the same evening, and a band formed of omentum was found at the point where pain had been located, fixed behind to the mesentery near the spine. This divided, and removed, the distended intestine, which was somewhat congested, protruded from the wound. A healthy loop was drawn out and opened longitudinally on its fundal surface, and some three ounces of fæcal material with a large amount of gas evacuated; the opening in the intestine was closed by Lembert sutures of fine silk, the bowel washed, and returned. The distension was greatly thereby reduced. The abdominal wound was closed by tier suture, no drainage. As we had no celloidin, the ordinary dressings were applied, with the result that the child, who was very emaciated, restless, and unamenable, managed to get her fingers, unobserved by the nurse, down under the bandage and scratched the wound with her nails. Suppuration started in one of the skin sutures, and spread from this to others. Some of the aponeurotic sutures became infected and required removal. By tying her hands to the bedside and the local use of iodine the process was checked, but it was necessary to open up the wound on the 29th Dec. and to remove some of the deeper sutures. The wound did not entirely heal until near the end of January 1899, nearly two months after the operation.

The immediate and constant inspection of the wound possible with celloidin would have prevented all this; besides that, she might have scratched the outside as much as she had wished—the dirty nail could never have come in contact with the wound at all.

These photos show very well the progress of wounds after sealing by celloidin.

Photo 3 shows a cœliotomy after 48 hours. The sutures can be seen through the transparent dressing, and the puckering

normally present. This puckering of the skin is not due to the presence of tension sutures, but simply to the contractility of the material employed.



48 HOURS AFTER OPERATION.

No. 4 shows a similar case 17 days after operation. The sutures are still in position.



17 DAYS AFTER OPERATION.



No. 5 shows No. 1, after three weeks; celloidin and sutures removed. The area is slightly stained. On the patient's left are the marks of plaster strips which held a blister in place.



THREE WEEKS AFTER OPERATION

No. 6, another case after 8 months. There is rather more stretching of the scar than usual.



8 MONTHS AFTER OPERATION.



If the three essential conditions of success, sterility, dryness, and airtight closure are present, the only drawback that I have found to the utility of the celloidin dressing, has been its tendency to produce small blisters at its edge. Celloidin, as it sets, which it does immediately, contracts, and drags upon the skin in all directions towards the line of union. This is a direct advantage, replacing as it does, the old tension sutures, which left such unsightly scars, but as it does so, small blisters tend to form just at its edge during the first three days. If these are larger than split peas, they may be opened, the fluid dried off, and the surface dusted with Boracic Acid, Dermatol, or any other drying powder. If not, they may safely be left. They gradually shrivel, and when the whole covering becomes loose, as it does between the 10th and 15th day, being then only held by the sutures, the new epidermis has formed under the now dry, scurfy material which represents the blister. In any case, I have never seen any ill effects follow their formation. In taking off the celloidin, the loose edge is turned up, each suture cut through on one side close to the skin, and drawn out as one proceeds. The whole then peels off without difficulty. Small hairs may also require to be snipped off in the process.

Even if the asepticity of one's work is not perfect, or blood has collected in the wound, it is an advantage to be able to see at once through the transparent dressing where it is faulty. Increased redness and heat, showing commencing inflammation, or a plain shiny surface, instead of the normal puckering, showing accumulation of fluid beneath, are both easily recognised, whilst the increasing tension is readily appreciated by the patient, since the celloidin is very resistant; the temperature also rises. In such a case, one must at once admit failure, remove the celloidin and some of the sutures, and dress in the usual way, but increased care and attention to small details will rapidly decrease the number of such cases, and enable us to ensure success. Anyone who has once achieved success by this method, will, I believe, at once concede its superiority to that of dressings.

